

APPENDIX II

QUALIFICATIONS FOR ADVANCEMENT IN RATING

ELECTRONICS TECHNICIAN (ET) Quals Current Through Revision A

GENERAL RATING (PO1 and CPO)

SCOPE

Electronics Technicians maintain, repair, calibrate, tune, and adjust electronic material (except airborne and weapon-control equipment) used for communication (except interior communication systems and teletype-writers) detection and tracking, recognition and identification, aids to navigation, and electronic countermeasures.

SERVICE RATINGS (PO3 and PO2)

SCOPES

ELECTRONICS TECHNICIAN N (Communications)

Electronics Technicians (N) maintain, repair, calibrate, tune, and adjust communications equipment, radio aids to navigation and radio countermeasures equipment, including radio and facsimile equipment, teletype and similar types of terminal equipment, data transmission systems, radio direction finding and loran receiving equipment, and radio beacons.

ELECTRONICS TECHNICIAN R (Radar)

Electronic Technicians (R) maintain, repair, calibrate, tune, and adjust electronic sea, land, and air detection and tracking equipment, electronic recognition and identification equipment and radar countermeasures equipment, including search radar and radiac equipment, IFF systems, and racons.

QUALIFICATIONS FOR ADVANCEMENT

A. SAFETY

1.00 Practical Factors

- .01 Demonstrate under simulated conditions the rescue of a person in contact with an energized electrical circuit, resuscitation of a person unconscious from electrical shock, and treatment for burns.
- .02 Demonstrate, while servicing equipment, safety precautions such as tagging switches, removing fuses, and grounding test equipment, using shorting bars and rubber mats

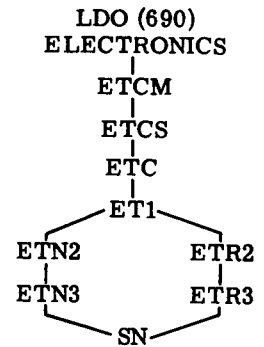
2.00 Knowledge Factors

- .01 Effects of electrical shock, methods of resuscitation of a person unconscious from electrical shock, and treatment for burns
- .02 Electrical and electronic safety precautions (except those applicable exclusively to line construction) as set forth in Chapter 18, U. S. Navy Safety Precautions (OpNav 34P1)

B. ELECTRICITY AND ELECTRONICS

1.00 Practical Factors

None.



CAREER PATTERN

ETN

ETR

Required for
Advancement to
ETN ETR ET

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3 3 -

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QUALIFICATIONS FOR ADVANCEMENT

B. ELECTRICITY AND ELECTRONICS—Continued

Required for
Advancement to
ETN ETR ET

2.00 Knowledge Factors

.01	Definition and usage of common electrical, magnetic, and electronic terms including:			
	a. Volt, ohm, ampere, watt, volt-ampere, henry, and farad	3	3	—
	b. Cycle, ampere-turn, coulomb, circular mil, conductor, insulator, field intensity, and flux density	3	3	—
	c. Gauss, permeability, hysteresis, eddy current, reactance, impedance, capacitance, inductance, self-inductance, and mutual and electromagnetic inductance	3	3	—
	d. Power factor, frequency, phase, RC time, attenuation, absorption, and conductance	3	3	—
	e. Modulation, demodulation, detection, selectivity, sensitivity, and class A, B, C, and AB amplifiers	3	3	—
	f. Filter, intermediate frequency, heterodyne, node, resonance, and nonlinear	3	3	—
	g. Sideband, single sideband, zero beat, AGC, and ganged tuning . .	3	3	—
.02	Interpretation of RETMA color coding of fixed capacitors and resistors and power, AF, and IF transformer connections	3	3	—
.03	Calculation of current, voltage, and resistance in d.c. series and parallel circuits containing not more than four elements	3	3	—
.04	Relationship of length and cross-sectional area to resistance of a conductor	3	3	—
.05	Relationship of resistance, temperature, and current in an electrical conductor	3	3	—
.06	Methods of obtaining three general types of bias-fixed, cathode, and grid leak	3	3	—
.07	Construction of a.c. and d.c. motors and generators; application of laws of magnetism to electrical rotating machinery	3	3	—
.08	Function of components in electrical/electronic circuits serving as resistors, rheostats, potentiometers, solenoids, inductors, relays, capacitors, fuses, switches, reactors, transformers, and crystals	3	3	—
.09	Types, structure, maintenance procedures, and electrical characteristics of batteries	3	3	—
.10	Function of elements used in vacuum tubes	3	3	—
.11	Relationship of current, voltage, and impedance in a.c. circuits . . .	3	3	—
.12	Calculation of current, voltage, phase, angle, impedance, power factor, and resonance in a.c. series and parallel circuits containing not more than four elements	3	3	—
.13	Meaning of cathode ray tube presentations on electronic equipment	3	3	—
.14	Cause and/or effect of sky, ground, and ground-reflected waves, and ionospheric reflecting layers on propagation	3	3	—
.15	Electrical characteristics of Hertz, Marconi, and dipole antennas	3	3	—
.16	Function and operating principles of components of a typical pulse radar set; timer, modulator, transmitter antenna, receiver, and indicators	—	3	—
.17	Function and operating principles of:			
	a. Stages of a typical radio transmitter; master oscillator, modulator, power amplifier, and antenna	3	—	—
	b. Stages of a typical superheterodyne receiver; antenna, RF amplifier, oscillator, mixer, IF amplifier, detector, AF amplifier, and speaker	3	—	—

QUALIFICATIONS FOR ADVANCEMENT

Required for
Advancement to
ETN ETR ET

B. ELECTRICITY AND ELECTRONICS—Continued

2.00 Knowledge Factors—Continued

c. Antenna couplers and remote control patching systems	3	—	—
.39 Function and operating principles of the following:			
a. Audio, video, RF, and IF amplifiers	3	3	—
b. Oscillators: tickler-feedback, Colpitts, ultra-audion, TPTG, push-pull, electron-coupled, transistor, Hartley-crystal controlled, and basic multivibrator	3	3	—
c. Rectifiers: copper oxide, selenium, silicon diodes, crystal, and electron tube	3	3	—
d. Detectors: diode and crystal	3	3	—
e. Tuned coupling and AGC circuits	3	3	—
f. Impedance matching, phase shifters, cathode followers, limiters and clippers, sawtooth generators, and phase inverters	3	3	—
g. Modulation: amplitude, frequency, phase and pulse; grid, screen, and plate	3	3	—
h. Coaxial transmission lines	3	3	—
i. Differentiators and integrators, peakers, discriminators, clippers, and transistors	2	2	—
j. Oscillators: blocking and Wein-bridge	2	2	—
k. Trigger, coincidence, AFC, counting, and phase splitting circuits	2	2	—
l. Paraphase and magnetic amplifiers	2	2	—
m. Modular construction	2	2	—
n. Vacuum tubes, gas-filled tubes, cathode ray tubes and magnetrons	2	2	—
o. Special purpose tubes such as traveling wave, carcinotrons, and high-powered klystron amplifiers	—	—	1
.40 Operating principles of basic meters and meter movements employing the following:			
a. D'Arsonval and electro-dynamometer movements	2	2	—
b. Shunts and multipliers	2	2	—
c. Thermocouples and rectifiers in a.c. meters	2	2	—
.41 Operational capabilities and limitations of electronic equipment . .	2	2	—
.42 Method of connecting moving element to resistors to form voltmeter or ammeter; meaning of meter sensitivity and effect of circuit loading	2	2	—
.43 Computations required to determine size of shunts and multi- pliers	2	2	—
.44 Characteristics and use of synchros and servomotors; methods of setting to electrical zero; purpose of gain, phase, and balance adjustments	2	2	—
.45 Function and operation of the following:			
a. Electronic switch, synchroscope and spectrum analyzer	2	2	—
b. Absorption wavemeter, grid dip and radio-interference field-intensity meters	2	2	—
.46 Applications and basic principles of wave guides, T/R and AT/R tubes, klystrons and magnetrons, crystal mixers, and radar modulators	2	2	—
.47 Cause and/or effect of an induction field and radiation field	2	2	—
.60 Operating principles and radiation characteristics of parabolic and lens antennas	—	—	1
.61 Operating principles and characteristics of, and repairs and calibrations authorized on, electronic test equipment in items D1.01 and B2.45	—	—	1

Appendix II—QUALIFICATIONS FOR ADVANCEMENT IN RATING

QUALIFICATIONS FOR ADVANCEMENT

Required for
Advancement to
ETN ETR ET

B. ELECTRICITY AND ELECTRONICS—Continued

2.00 Knowledge Factors—Continued

.80 Theory of single sideband radio transmission and reception	—	—	C
.81 Polarization and directional characteristics of antenna arrays such as driven arrays (collinear), parasitic arrays (Yagi), parabolic, corner or flat reflectors, phased arrays, waveguide, and type antennas	—	—	C

C. OPERATIONAL MAINTENANCE

1.00 Practical Factors

.01 Inspect, clean, and lubricate electronic equipment in accordance with technical publications	3	3	—
.02 Test and/or replace plugs, lamps, fuses, switches, electron tubes, jacks, cables, and wiring	3	3	—
.03 Select, use, and maintain handtools and small portable power tools necessary for maintenance and repair of electronic equipment	3	3	—
.04 Perform operational tests and make external adjustments on electronic equipment	3	3	—
.05 Utilize distribution patching system for radio transmitters, receivers, and antennas for all local and remote operation positions	3	3	—
.06 Inspect and clean commutators and slipring assemblies; inspect and replace brushes	3	3	—
.07 Make electrical connections and splices including soldering joints	3	3	—
.08 Manipulate external controls; read and interpret dials, meter indications, and cathode ray tube presentations on electronic equipment	3	3	—
.09 Read schematic wiring diagrams of electrical and electronic circuits; identify and interpret electrical, electronic, and mechanical symbols shown in electronic technical maintenance publications and installation blueprints	3	3	—

2.00 Knowledge Factors

.01 Importance of using proper lubricants and solvents in maintenance of electronic equipment	3	3	—
.02 Purpose of operator's controls and adjustments such as: a. Receiver gain, transmitter tuning and antenna tuning	3	3	—
b. Radar intensity, focus, receiver tuning, antenna rotation, range, and IFF interrogation switch, loran sweep speed switch, and coarse and fine delay	—	3	—
.80 Effects of environmental conditions upon operation of electronic and electrical equipment and special maintenance techniques involved for equipment to be operated at extreme temperature and humidity	—	—	C

D. TECHNICAL MAINTENANCE

1.00 Practical Factors

.01 Demonstrate use of the following test equipment: a. Electronic and nonelectronic multimeters	3	3	—
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ELECTRONICS TECHNICIAN 3

QUALIFICATIONS FOR ADVANCEMENT

D. TECHNICAL MAINTENANCE—Continued	Required for Advancement to		
	ETN	ETR	ET
1.00 Practical Factors—Continued			
b. Tube tester, oscilloscope, and AF signal generator	3	3	—
c. Capacitance-inductance-resistance bridge	3	3	—
d. RF signal generator, frequency standards, and megohmmeter . .	3	3	—
e. Range mark generator and echo boxes	—	3	—
.02 Make tests for short circuits, grounds, and continuity of interconnecting cables between components of electronic equipment	3	3	—
.03 Localize equipment casualties to components of a system of electronic equipment	3	3	—
.04 Locate and identify components, assemblies, subassemblies, and primary and casualty power circuits of electronic equipment by reference to technical maintenance publications, block diagrams, and installation blueprints	3	3	—
.05 Locate in technical and maintenance publications information necessary for maintenance and repair of electronic equipment; enter corrections to publications when changes are made	3	3	—
.40 Effect authorized field changes to electronic equipment in accordance with instructions and diagrams	2	2	—
.41 Operate the following test equipment:			
a. Electronic switch and spectrum analyzer	2	2	—
b. Synchroscope	—	2	—
c. Absorption wavemeter, grid dip, and radio-interference field-intensity meters	2	2	—
.42 Test electronic circuits for continuity, short circuits, and grounds; measure electrical quantities such as voltage, current, power, and frequency, and compare with established values; use an oscilloscope to view circuit waveforms and compare with established optimum performance waveforms required in electronic equipment	2	2	—
.43 Perform sensitivity and selectivity measurements and align circuits as necessary for optimum performance of electronic equipment	2	2	—
.44 Localize electronic equipment casualties to parts or subassemblies; repair by replacement of subassemblies or parts	2	2	—
.45 Repair multimeters, oscilloscopes, test oscillators, and signal generators	2	2	—
.46 Perform tests, adjustments, and repairs necessary for proper operation of electromechanical servomechanisms and synchro control circuits including:			
a. Electrical zeroing of synchros	2	2	—
b. Testing servomotors and amplidyne	2	2	—
c. Gain, phase, and balancing adjustments	2	2	—
.60 Repair countermeasures equipment	—	—	1
.61 View and compare with established standards, waveforms of the following circuits: Squaring and peaking, clamping circuits, high vacuum tube sweep generators (hard tube type), trapezoidal sweep generator, phantastrons, blocking oscillators, and counting circuits	—	—	1
.62 Align circuits by synchronizing multivibrators or blocking oscillators with sine wave, positive pulses, or submultiples of trigger frequency, or negative pulses	—	—	1
.63 Analyze and evaluate electrical and electronic tests; make adjustments, calibrations, and repairs necessary for optimum performance of electronic equipment	—	—	1

QUALIFICATIONS FOR ADVANCEMENT

D. TECHNICAL MAINTENANCE—Continued

Required for
Advancement to
ETN ETR ET

1.00 Practical Factors—Continued

.64 Evaluate test equipment for correct operation; make authorized repairs and calibrations	-	-	1
.79 Adjust antenna arrays such as: Driven arrays (collinear), parasitic arrays (Yagi), parabolic, corner, or flat reflections back of dipoles, phased arrays, and waveguide type antennas for:			
a. Traffic requirements	-	-	1
b. Environmental conditions	-	-	C
.80 Test and evaluate for proper and secure installation and optimum performance, newly installed or overhauled components assemblies, or subassemblies of electronic equipment	-	-	C

2.00 Knowledge Factors

.01 Method of soldering and soldering equipment used in maintenance and repair of electronic equipment	3	3	-
.40 Application of oscilloscope waveform analysis to location of circuit malfunctions	2	2	-

E. ELECTRONICS ADMINISTRATION

1.00 Practical Factors

.01 Record test data and work accomplished in required work logs, equipment histories, and checkoff lists	3	3	-
.02 Take, record, and report inventories of tools and portable test equipment available for maintenance and repair of electronic equipment	3	3	-
.03 Prepare Current Ship's Maintenance Project (CSMP)	3	3	-
.40 Gather information for, and prepare and complete entries in, electronic equipment failure reports	2	2	-
.41 Prepare job orders and work requests	2	2	-
.42 Obtain part and stock numbers from technical and supply publications for tools and replacement parts; procedures for requisitioning such material	2	2	-
.60 Prepare and complete periodic or recurring reports concerning performance and/or maintenance of electronic equipment	-	-	1
.61 Inspect completed work logs and checklists; review electronic equipment failure reports, requisitions for tools and replacement parts, inventories of tools and portable test equipment, job orders, and work requests	-	-	1
.62 Supervise and train personnel in maintenance and repair of radio, radar, and countermeasures equipment	-	-	1
.80 Qualify individual operators to carry out authorized performance standards tests on electronic equipment to which assigned	-	-	C
.81 Evaluate complete electronic equipment failure reports, requisitions for tools and replacement parts, inventories of tools and portable test equipment job orders, work requests, electronic equipment histories, and periodic or recurring reports concerning performance and/or maintenance of electronic equipment	-	-	C
.82 Organize and administer maintenance and repair of electronic equipment	-	-	C

ELECTRONICS TECHNICIAN 3

QUALIFICATIONS FOR ADVANCEMENT

E. ELECTRONICS ADMINISTRATION—Continued

**Required for
Advancement to
ETN ETR ET**

2.00 Knowledge Factors

.01 System of assigning "AN" letter-number combinations as designation for electronic equipment	3	3	—
.02 Types of information contained in electronic technical and maintenance publications	3	3	—
.60 Methods, techniques, and devices applicable in electronic maintenance training of teams and individuals	—	—	1
.80 Procedures for accounting for electronic equipment, maintaining control of inventories and workflow, and reporting equipment status and work accomplished	—	—	C
.81 Current bureau directives on operational and maintenance responsibilities of enlisted personnel for electronic equipment . . .	—	—	C